PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME/ ANSI B16.1	(1996) Cast Iron Pipe Flanges and Flanged Fittings
ASME/ ANSI B18.2.2	(1987; R 1993) Square and Hex Nuts (Inch Series)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 47	(1990; R 1995) Ferritic Malleable Iron Castings
ASTM A 48	(1994; Rev. A) Gray Iron Castings
ASTM A 74	(1996) Cast Iron Soil Pipe and Fittings
ASTM A 307	(1994) Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A 536	(1984; R 1993) Ductile Iron Castings
ASTM A 563	(1996) Carbon and Alloy Steel Nuts
ASTM A 746	(1995) Ductile Iron Gravity Sewer Pipe
ASTM C 94	(1997) Ready- Mixed Concrete
ASTM C 150	(1997) Portland Cement
ASTM C 564	(1995; Rev. A) Rubber Gaskets for Cast Iron Soil Pipe and Fittings
ASTM C 972	(1995) Compression- Recovery of Tape Sealant
ASTM D 412	(1997) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 624	(1991) Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
ASTM D 2321	(1989; R 1995) Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity- Flow Applications

ASTM D 2412	(1996; Rev. A) Determination of External Loading Characteristics of Plastic Pipe by Parallel- Plate Loading
ASTM D 2680	(1995; Rev. A) Acrylonitrile- Butadiene- Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
ASTM D 2751	(1996; Rev. A) Acrylonitrile- Butadiene- Styrene (ABS) Sewer Pipe and Fittings
ASTM D 3034	(1997) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3139	(1996; Rev. A) Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D 3212	(1996; Rev. A) Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals
ASTM F 402	(1993) Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
ASTM F 477	(1996; Rev. A) Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F 758	(1995) Smooth- Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
ASTM F 794	(1997) Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
ASTM F 949	(1996; Rev. A) Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C104/ A21.4	(1995) Cement- Mortar Lining for Ductile- Iron Pipe and Fittings for Water
AWWA C105/ A21.5	(1993) Polyethylene Encasement for Ductile - Iron Pipe Systems

AWWA C110/ A21.10	(1993) Ductile- Iron and Gray- Iron Fittings, 3 in. Through 48 in. (75 mm Through 1200 mm), for Water and Other Liquids
AWWA C111/ A21.11	(1995) Rubber- Gasket Joints for Ductile- Iron Pressure Pipe and Fittings
AWWA C115/ A21.15	(1994) Flanged Ductile- Iron Pipe with Ductile- Iron or Gray- Iron Threaded Flanges
ANSI/ AWWA C151/ A21.51	(1996) Ductile- Iron Pipe, Centrifugally Cast, for Water or Other Liquids
AWWA C153/ A21.53	(1994) Ductile- Iron Compact Fittings, 3 in. Through 24 in. (76 mm Through 610 mm) and 54 in. Through 64 in. (1,000 mm Through 1,600 mm), for Water Service
AWWA C600	(1993) Installation of Ductile- Iron Water Mains and Their Appurtenances
AWWA C606	(1997) Grooved and Shouldered Joints
AWWA C900	(1989; Addendum 1992) Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. Through 12 in., for Water Distribution
AWWA M23	(1980) PVC Pipe - Design and Installation

CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.27	Fixed Ladders

CAST IRON SOIL PIPE INSTITUTE (CISPI)

CISPI 301	(1995) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
CISPI 310	(1995) Couplings Joint for Use in Connection with Hubless Cast Iron Soil Pipe and Fitting

FEDERAL SPECIFICATIONS (FS)

FS RR- F- 621	(Rev. E) Frames, Covers, Gratings, Steps, Sump and Catch Basin, Manhole

UNI- BELL PVC PIPE ASSOCIATION (UBPPA)

UBPPA UNI- B- 3	(1988) Installation of Polyvinyl Chloride (PVC) Pressure Pipe
UBPPA UNI- B- 6	(1990) Low- Pressure Air Testing of Installed Sewer Pipe

1.2 SYSTEM DESCRIPTION

1.2.1 Sanitary Sewer Gravity Pipeline

Provide mains and laterals ductile-iron pipe or polyvinyl chloride (PVC) plastic pipe at the Contractor's option. Provide building connections of cast iron soil pipe or polyvinyl chloride (PVC) plastic pipe at the Contractor's option.

Provide new sanitary gravity sewer piping and appurtenances. Provide each system complete and ready for operation. The exterior sanitary gravity sewer system includes equipment, materials, installation, and workmanship as specified herein more than 5 feet outside of building walls.

1.3 SUBMITTALS

Submit the following in accordance with Section 01330, "Submittal Procedures."

1.3.1 SD- 02 Manufacturer's Catalog Data

a. Pipeline materials including joints, fittings, and couplings

Submit manufacturer's standard drawings or catalog cuts.

1.3.2 SD- 04 Drawings

a. Cleanouts

b. Metal items

1.3.3 SD-13, Certificates

a. Pipeline materials, joints and fittings, including factory-applied linings

b. Cleanouts

Certificates shall attest that tests set forth in each applicable referenced publication have been performed, whether specified in that publication to be mandatory or otherwise. Production control tests shall have been performed at the intervals or frequency specified in the referenced publication. Other tests shall have been performed within 3 years of the date of submittal of certificates on the same type, class, grade, and size of material as is being provided for the project.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

1.4.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.4.1.2 Metal Items

Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

1.4.1.3 Cement, Aggregate, and Reinforcement

As specified in Section 03300, "Cast- In- Place Concrete".

1.4.2 Handling

Handle pipe, fittings, and other accessories in such manner as to ensure delivery to the trench in sound undamaged condition. Take special care not to damage linings of pipe and fittings; if lining is damaged, make satisfactory repairs. Carry, do not drag, pipe to trench.

PART 2 - PRODUCTS

2.1 PIPELINE MATERIALS

2.1.1 Ductile Iron Gravity Sewer Pipe and Associated Fittings

2.1.2.1 Ductile Iron Gravity Pipe and Fittings

Ductile iron pipe shall conform to ASTM A 746, Thickness Class 150. Fittings shall conform to AWWA C110/ A21.10 or AWWA C153/ A21.53. Fittings with push- on joint ends shall conform to the same requirements as fittings with mechanical- joint ends, except that the bell design shall be modified, as approved by the Contracting Officer, for push- on joint. Fittings shall have strength at least equivalent to that of the pipe. Ends of pipe and fittings shall be suitable for the joints specified hereinafter. Pipe and fittings shall have cement- mortar lining conforming to AWWA C104/ A21.4, standard thickness.

2.1.2.2 Ductile Iron Gravity Joints and Jointing Materials

Pipe and fittings shall have push- on joints or mechanical joints, except as otherwise specified in this paragraph. Push- on joint pipe ends and fitting ends, gaskets, and lubricant for joint assembly shall conform to AWWA C111/ A21.11. Mechanical joint requirements for pipe ends, glands, bolts and nuts, and gaskets shall conform to AWWA C111/ A21.11.

2.1.3 PVC Plastic Gravity Sewer Piping

2.1.3.1 PVC Plastic Gravity Pipe and Fittings

SDR 35 with ends suitable for elastomeric gasket joints.

2.1.3.2 PVC Plastic Gravity Joints and Jointing Material

Joints shall conform to ASTM D 3212. Gaskets shall conform to ASTM F 477.

2.2 CONCRETE MATERIALS

Concrete materials shall be as specified in Section 03300, "Cast- In- Place Concrete."

PART 3- EXECUTION

3.1 INSTALLATION OF PIPELINES AND APPURTENANT CONSTRUCTION

3.1.1 General Requirements for Installation of Pipelines

Apply except where specific exception is made in the following paragraphs entitled "Special Requirements."

3.1.1.1 Location

The work covered by this section shall terminate at a point approximately 5 feet from the building , unless otherwise indicated. Where the location of the sewer is not clearly defined by dimensions on the drawings, do not lay sewer line closer horizontally than 10 feet to a water main or service line. Where sanitary sewer lines pass above water lines, encase sewer in concrete for a distance of 10 feet on each side of the crossing, or substitute rubber- gasketed pressure pipe for the pipe being used for the same distance. Where sanitary sewer lines pass below water lines, lay pipe so that no joint in the sewer line will be closer than 3 feet, horizontal distance, to the water line.

3.1.1.2 Earthwork

Perform earthwork operations in accordance with Section 02302 “Excavation, Backfilling and Compacting for Utilities.”

3.1.1.3 Pipe Laying and Jointing

Inspect each pipe and fitting before and after installation; replace those found defective and remove from site. Provide proper facilities for lowering sections of pipe into trenches. Lay nonpressure pipe with the bell ends in the upgrade direction. Adjust spigots in bells to give a uniform space all around. Blocking or wedging between bells and spigots will not be permitted. Replace by one of the proper dimensions, pipe or fittings that do not allow sufficient space for installation of joint material. At the end of each work day, close open ends of pipe temporarily with wood blocks or bulkheads. Provide trenches for checking and ensuring that pipe invert elevations are as indicated. Laser beam method may be used in lieu of batterboards for the same purpose.

3.1.2 Special Requirements

3.1.2.1 Installation of Ductile Iron Gravity Sewer Pipe

Unless otherwise specified, install pipe and associated fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of AWWA C600 for pipe installation and joint assembly.

a. Make push- on joints with the gaskets and lubricant specified for this type joint and assemble in accordance with the applicable requirements of AWWA C600 for joint assembly. Make mechanical- joints with the gaskets, glands, bolts, and nuts specified for this type joint and assemble in accordance with the applicable requirements of AWWA C600 for joint assembly and the recommendations of Appendix A to AWWA C111/ A21.11.

b. Exterior protection: Completely encase buried ductile iron pipelines with polyethylene tube or sheet in accordance with AWWA C105/ A21.5, using Class A polyethylene film.

3.1.2.2 Installation of PVC Plastic Piping

Install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of ASTM D 2321 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of ASTM D 2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

3.1.2.3 Cleanouts

Construct cleanouts of cast iron soil pipe and fittings.

3.1.3 Concrete Work

Cast- in- place concrete is included in Section 03300, "Cast- In- Place Concrete."

3.1.4 Miscellaneous Construction and Installation

3.1.4.1 Metal Work

a. Workmanship and finish: Perform metal work so that workmanship and finish will be equal to the best practice in modern structural shops and foundries. Form iron to shape and size with sharp lines and angles. Do shearing and punching so that clean true lines and surfaces are produced. Make castings sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Give exposed surfaces a smooth finish with sharp well- defined lines and arises. Provide necessary rabbets, lugs, and brackets wherever necessary for fitting and support.

b. Field painting: After installation, clean cast- iron, covers, not buried in concrete to bare metal of mortar, rust, grease, dirt, and other deleterious materials and apply a coat of bituminous paint. Do not paint surfaces subject to abrasion.

3.2 FIELD QUALITY CONTROL

3.2.1 Field Tests and Inspections

The Contracting Officer will conduct field inspections and witness field tests specified in this section. The Contractor shall perform field tests and provide labor, equipment, and incidentals required for testing. Be able to produce evidence, when required, that each item of work has been constructed in accordance with the drawings and specifications.

3.2.2 Tests for Nonpressure Lines

Check each straight run of pipeline for gross deficiencies.

3.2.2.1 Leakage Tests

Test lines for leakage by either infiltration tests or ex-filtration tests, or by low- pressure air tests. Prior to testing for leakage, backfill trench up to at least lower half of pipe. When necessary to prevent pipeline movement during testing, place additional backfill around pipe sufficient to prevent movement, but leaving joints uncovered to permit inspection. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

a. Infiltration tests and exfiltration tests: Perform these tests for sewer lines made of the specified materials, not only concrete, in accordance with ASTM C 969. Make calculations in accordance with the Appendix to ASTM C 969.

b. Low- pressure air tests: Perform tests as follows:

(1) Ductile- iron pipelines: Test in accordance with the applicable requirements of ASTM C 924M ASTM C 924. Allowable pressure drop shall be as given in ASTM C 924M ASTM C 924. Make calculations in accordance with the Appendix to ASTM C 924M ASTM C 924.

(2) PVC plastic pipelines: Test in accordance with UBPPA UNI- B- 6. Allowable pressure drop shall be as given in UBPPA UNI- B- 6. Make calculations in accordance with the Appendix to UBPPA UNI- B- 6.

3.2.3 Field Tests for Concrete

Field testing requirements are covered in Section 03300, “Cast-in-Place-Concrete.”

END OF SECTION